

# **SYNTHESIS OF A PARTICULATE COPOLYMER CONTAINING** **HYDROPHILIC FUNCTIONALITY**

## **CLAIMS**

5

1. A process for synthesizing a particulate copolymer comprising: providing a reaction mixture comprising a reaction medium, a polymerization stabilizer, a water-insoluble ethylenically unsaturated monomer and an ethylenically unsaturated monomer containing hydrophilic functionality, said reaction mixture having a viscosity value of at least 10 cps measured at 40°C, and polymerizing the water-insoluble ethylenically unsaturated monomer and the ethylenically unsaturated monomer containing hydrophilic functionality.

10

2. A process for synthesizing a particulate copolymer as in claim 1, wherein said reaction mixture has a viscosity of at least 25 cps measured at 40 °C.

15

3. A process for synthesizing a particulate copolymer as in claim 1, wherein said reaction medium comprises a mixture of water and at least one aliphatic alcohol having from 1 to 5 carbon atoms.

20

4. A process for synthesizing a particulate copolymer as in claim 1, wherein the reaction medium comprises a water/alcohol mixture in a weight ratio from 1:1 to 3:1.

5. A process for synthesizing a particulate copolymer as in claim 1, wherein the polymerization stabilizer is selected from the group consisting of polyvinylpyridine, poly-N-vinylimidazole, polyethyleneimine polyvinylpyrrolidone, polyvinylalcohol, acid-processed gelatin and alkali-processed gelatin.

25

6. A process for synthesizing a particulate copolymer as in claim 1, wherein the water-insoluble ethylenically unsaturated monomer is selected from the group consisting of methylacrylate, methylmethacrylate, ethylacrylate, ethylmethacrylate, butylmethacrylate and butylacrylate.

30

7. A process for synthesizing a particulate copolymer as in claim 1, wherein the ethylenically unsaturated monomer containing hydrophilic functionality is selected from the group consisting of acrylic acid, methacrylic acid, ethacrylic acid, hydroxyethyl methacrylate, hydroxyethyl acrylate, itaconic acid, maleic acid, fumaric acid, 5 monoalkyl itaconate, monoalkyl maleate, citraconic acid, styrenecarboxylic acid, aminomethylstyrene, styrene sulfonic acid, methacryloxyethyltrimethyl ammonium chloride, acryloxyethyltrimethyl ammonium chloride, methacryloxyethyldimethylbenzyl ammonium chloride, dimethylaminoethylmethacrylate and dimethylamino-ethyl  
10 ethacrylate.

8. A process for synthesizing a particulate copolymer comprising the steps of (a) dispersing a polymerization stabilizer in a reaction medium, (b) heating the reaction mixture to a temperature within the range of from 60° to 90°C, (c) adding to the  
15 reaction mixture a water-insoluble ethylenically unsaturated monomer and a ethylenically unsaturated monomer containing hydrophilic functionality, (d) adding to the reaction mixture a polymerization catalyst, and (e) maintaining the reaction mixture at reflux temperature until completion of polymerization, characterized in that, at the end of step (c), said reaction mixture has a viscosity value  
20 of at least 10 cps measured at 40 °C.

9. A process for synthesizing a particulate copolymer as in claim 8, wherein the polymerization catalyst is selected from the group consisting of an azo initiator and a peroxide initiator.  
25

10. A process for synthesizing a particulate copolymer as in claim 8, wherein the polymerization catalyst is selected from the group consisting of 2,2'-azobisisobutyronitrile, 2,2'-azobis(2,4-dimethylvaleronitrile), benzoyl peroxide and lauryl peroxide.  
30

11. A particulate copolymer dispersion comprising a particulate copolymer of a water-insoluble ethylenically unsaturated monomer and a ethylenically unsaturated monomer containing hydrophilic functionality and a polymerization stabilizer dispersed

in a mixture of water and at least one aliphatic alcohol having from 1 to 5 carbon atoms, said particulate copolymer dispersion being prepared by the process of claim 1.

12. The particulate copolymer dispersion of claim 11 wherein the weight average  
5 diameter of said particulate copolymer ranges from 0.5 to 8  $\mu\text{m}$ .

13. The particulate copolymer dispersion of claim 11 wherein the deviation coefficient of said particulate copolymer is less than 1.5.

10 14. A particulate copolymer dispersion comprising a particulate copolymer of a water-insoluble ethylenically unsaturated monomer and a ethylenically unsaturated monomer containing hydrophilic functionality and a polymerization stabilizer dispersed in a mixture of water and at least one aliphatic alcohol having from 1 to 5 carbon atoms, said particulate copolymer dispersion being prepared by the process of claim 8.

15

15. The particulate copolymer dispersion of claim 14 wherein the weight average diameter of said particulate copolymer ranges from 0.5 to 8  $\mu\text{m}$ .

16. The particulate copolymer dispersion of claim 14 wherein the deviation  
20 coefficient of said particulate copolymer is less than 1.5.

17. A microparticle composition comprising a particulate copolymer and an auxiliary agent, wherein the particulate copolymer comprises a water-insoluble ethylenically unsaturated monomer and a ethylenically unsaturated monomer  
25 containing hydrophilic functionality prepared by the process of claim 1, and wherein the auxiliary agent is encapsulated in the copolymer and is selected from the group consisting of bioactive agents, dyes, pigments, and gases.

18. A microparticle composition comprising a particulate copolymer and an  
30 auxiliary agent, wherein the particulate copolymer comprises a water-insoluble ethylenically unsaturated monomer and a ethylenically unsaturated monomer containing hydrophilic functionality prepared by the process of claim 8, and wherein

the auxiliary agent is encapsulated in the copolymer and is selected from the group consisting of bioactive agents, dyes, pigments, and gases.

19. A photographic material comprising a support base having coated thereon at  
5 least one red-sensitive silver halide emulsion layer comprising a cyan-dye forming  
coupler, at least one green-sensitive silver halide emulsion layer comprising a magenta-  
dye forming coupler, at least one blue-sensitive silver halide emulsion layer comprising  
a yellow-dye forming coupler and an outer gelatin protective layer comprising  
particulate copolymers prepared by the process of claim 1.

10

20. A photographic material comprising a support base having coated thereon at least  
one red-sensitive silver halide emulsion layer comprising a cyan-dye forming coupler,  
at least one green-sensitive silver halide emulsion layer comprising a magenta-dye  
forming coupler, at least one blue-sensitive silver halide emulsion layer comprising a  
15 yellow-dye forming coupler and an outer gelatin protective layer comprising particulate  
copolymers prepared by the process of claim 8.